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EXAMINER	
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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/692,020	BILLINGHURST ET AL.	
	Examiner	Art Unit	
	Kandasamy Thangavelu	2123	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on 22 October 2003.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-31 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-7,10,12-27 and 29-31 is/are rejected.

7)☒ Claim(s) 8,9,11 and 28 is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on 02 November 2004 is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date 8/6/04 and 11/8/04.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application (PTO-152)

6) ☐ Other: _____.

DETAILED ACTION

1. Claims 1-31 of the application have been examined.

Information Disclosure Statement

2. Acknowledgment is made of the information disclosure statements filed on August 16, 2004 and November 8, 2004 together with a list of patents and copies of papers. The patents and papers have been considered.

Drawings

3. The drawings submitted on November 2, 2004 are accepted.

Specification

4. The disclosure is objected to because of the following informalities:

Page 1, Para 0004, Line 4, "It may also a surface presented" appears to be incorrect and it appears that it should be "It may also be a surface presented".

Page 4, Para 0027, Lines 7-8, "when the surface is different distances from the camera" appears to be incorrect and it appears that it should be "when the surface is at different distances from the camera".

Page 6, Para 0033, Line 2, "The facility begins in market based initialization mode" appears to be incorrect and it appears that it should be "The facility begins in marker based initialization mode".

Page 9, Para 0043, Line 4 to Page 10, Para 0043, Line 1, "U.S. provisional Patent Application No. _________ (patent counsel's docket no. 37181-8002US00)" appears to be incorrect and it appears that it should be "U.S. provisional Patent Application No. 60/513,725".

Appropriate corrections are required.

Claim Objections

5. The following is a quotation of 37 C.F.R § 1.75 (d)(1):

> The claim or claims must conform to the invention as set forth in the remainder of the specification and terms and phrases in the claims must find clear support or antecedent basis in the description so that the meaning of the terms in the claims may be ascertainable by reference to the description.

6. Claim 20 is objected to because of the following informalities:

Claim 20, Lines 1-2, "A computer-readable medium whose contents cause a computing system to track the movement …" appears to be incorrect and it appears that it should be "A computer-readable medium comprising computer executable instructions which when executed on a computing system cause the computing system to track the movement …".

Appropriate correction is required.

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains.

8. The factual inquiries set forth in *Graham* v. *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

9. Claims 1-7, 12-26 and 29-30 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Aman et al.** (U.S. Patent Application 2003/0095186) in view of **Rowe et al.** (U.S. Patent 6,914,599), and further in view of **Kanbara et al.** ("A stereo vision-based mixed reality system with natural feature point tracking", March 2001, submitted by the applicants as part of IDS).

9.1 **Aman et al.** teaches optimization for live event, real-time, 3D object tracking. Specifically, as per claim 1, **Aman et al.** teaches a method in a computing system for tracking the movement of a dimensional object having an arbitrary appearance relative to a camera (Page

1, Para 0001, Para 0012 and Para 0021; Page 4, Para 0071; Page 6, Para 0011, L1-4; Page 17, Para 0261; Page 21, Para 0297, L14-16; Page 21, Para 0306), comprising:

capturing an image of the object (Page 1, Para 0020, L6-10; Page 6, Para 0118, L1-4);

analyzing the captured image of the object (Page 16, Para 0246, L1-6);

receiving a sequence of images captured by the camera (Page 1, Para 0020, L6-10; Page 6, Para 0118, L1-4); and

for each image of the sequence:

identifying the 3-dimensional positions at which the selected objects occur in the image (Page 1, Para 0012; Page 1, Para 0014).

Aman et al. does not expressly teach a method in a computing system for tracking the movement of a dimensional surface having an arbitrary appearance relative to a camera, comprising capturing an image of the surface; analyzing the captured image of the surface; receiving a sequence of images captured by the camera, at least some of which constitute a view of at least a portion of the surface; and determining the 3-dimensional location and orientation of the surface in the current image of the sequence with respect to the camera. **Rowe et al.** teaches a method in a computing system for tracking the movement of a dimensional surface having an arbitrary appearance relative to a camera (CL2, L13-16; CL13, L20-21), comprising capturing an image of the surface; analyzing the captured image of the surface (CL2, L13-16; CL13, L20-21); receiving a sequence of images captured by the camera, at least some of which constitute a view of at least a portion of the surface (CL2, L13-16; CL13, L20-21); and determining the 3-dimensional location and orientation of the surface in the current image of the sequence with

respect to the camera (CL2, L1-3; CL2, L13-16; CL2, L24-27). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the method of **Aman et al.** with the method of **Rowe et al.** that included a method in a computing system for tracking the movement of a dimensional surface having an arbitrary appearance relative to a camera, comprising capturing an image of the surface; analyzing the captured image of the surface; receiving a sequence of images captured by the camera, at least some of which constituted a view of at least a portion of the surface; and determining the 3-dimensional location and orientation of the surface in the current image of the sequence with respect to the camera, because that would allow generation of representation of the surfaces and objects in three-dimensional computer model using moving pictures such as video images (CL1, L5-7).

Aman et al. and **Rowe et al.** do not expressly teach analyzing the captured image of the surface to identify visual features present in the captured image; from the identified visual features, selecting a plurality of visual features for use in tracking the movement of the surface; identifying the 2-dimensional positions at which the selected features occur in the image; and based upon the 2-dimensional positions at which the features are identified in the image, determining the 3-dimensional location and orientation. **Kanbara et al.** teaches analyzing the captured image of the surface to identify visual features present in the captured image (Page 1, CL2, Para 2, L1-5); from the identified visual features, selecting a plurality of visual features for use in tracking the movement of the surface (Page 1, CL2, Para 2, L1-5); identifying the 2-dimensional positions at which the selected features occur in the image (Page 1, CL2, Para 2, L1-5); and based upon the 2-dimensional positions at which the features are identified in the image, determining the 3-dimensional location and orientation (Page 1, CL2, Para 2, L1-5; Page 1, CL2,

Para 1, L2-6). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the method of **Aman et al.** and **Rowe et al.** with the method of **Kanbara et al.** that included analyzing the captured image of the surface to identify visual features present in the captured image; from the identified visual features, selecting a plurality of visual features for use in tracking the movement of the surface; identifying the 2-dimensional positions at which the selected features occur in the image; and based upon the 2-dimensional positions at which the features are identified in the image, determining the 3-dimensional location and orientation, because that would allow a wide range of registration between real world and virtual worlds by tracking the fiducial markers and natural feature points from the initial image (Page 1, CL2, Para 2, L1-5; Page 1, CL1, Para 1, L8-12).

9.2 As per claim 2, **Aman et al., Rowe et al.** and **Kanbara et al.** teach the method of claim 1. **Aman et al.** and **Rowe et al.** do not expressly teach the identification of the 2-dimensional positions at which the selected features occur in the image. **Kanbara et al.** teaches the identification of the 2-dimensional positions at which the selected features occur in the image (Page 1, CL2, Para 2, L1-5).

Aman et al. and **Kanbara et al.** do not expressly teach that identification of the 2-dimensional positions at which the selected features occur in the image is predicated on an assumption that the selected features appear as coplanar in the image. **Rowe et al.** teaches that identification of the 2-dimensional positions at which the selected features occur in the image is predicated on an assumption that the selected features appear as coplanar in the image (CL2, L13-16; CL13, L20-21).

9.3 As per claims 3-5, **Aman et al., Rowe et al.** and **Kanbara et al.** teach the method of claim 1. **Aman et al.** and **Kanbara et al.** do not expressly teach that the surface is a 2-dimensional surface; the surface is a flat surface; and the surface is an irregular body that appears flat when observed at a distance. **Rowe et al.** teaches that the surface is a 2-dimensional surface; the surface is a flat surface; and the surface is an irregular body that appears flat when observed at a distance (CL2, L13-16; CL13, L20-21).

9.4 As per claims 6 and 7, **Aman et al., Rowe et al.** and **Kanbara et al.** teach the method of claim 1. **Aman et al.** and **Rowe et al.** do not expressly teach using the determined location and orientation of the surface to introduce a supplemental image into the images of the sequence at a size, location, and orientation that are relative to those of the surface; and using the determined location and orientation of the surface to superimpose a view of a 3-dimensional object over the surface. **Kanbara et al.** teaches using the determined location and orientation of the surface to introduce a supplemental image into the images of the sequence at a size, location, and orientation that are relative to those of the surface; and using the determined location and orientation of the surface to superimpose a view of a 3-dimensional object over the surface (Page 1, CL1. Para 3, L1-5 and L10-11).

9.5 As per claim 12, **Aman et al., Rowe et al.** and **Kanbara et al.** teach the method of claim 1. **Aman et al.** and **Rowe et al.** do not expressly teach for each image of the sequence based upon the 2-dimensional positions at which the features are identified in one or more prior images

of the sequence, predicting 2-dimensional positions at which the features will occur in the current image; and establishing search zones about the predicted positions, and wherein identifying the 2-dimensional positions at which the selected features occur in the image comprises searching the established search zones for the selected features. **Kanbara et al.** teaches for each image of the sequence based upon the 2-dimensional positions at which the features are identified in one or more prior images of the sequence, predicting 2-dimensional positions at which the features will occur in the current image (Page 1, CL2, Para 2, L1-5; Page 1, CL2, Para 3, L1-3 and L5-7; Page 2, CL1, Para 1, L4-6; Page 2, CL1, Para 3, L7-10); and establishing search zones about the predicted positions, and wherein identifying the 2-dimensional positions at which the selected features occur in the image comprises searching the established search zones for the selected features (Page 1, CL2. Para 3, L1-8).

9.6 As per claim 13, **Aman et al., Rowe et al.** and **Kanbara et al.** teach the method of claim 1. **Aman et al.** and **Rowe et al.** do not expressly teach that the surface, in addition to having an arbitrary appearance, is modified to contain one or more fiducial markers, the method further comprising, in a first image of the sequence, identifying and analyzing a portion of the image corresponding to the fiducial markers to determining the 3-dimensional location and orientation of the surface in the image, and wherein the determining the 3-dimensional location and orientation of the surface in the first image of the sequence is used to identify the 2-dimensional positions at which the selected features occur in the first image of the sequence. **Kanbara et al.** teaches that the surface, in addition to having an arbitrary appearance, is modified to contain one or more fiducial markers (Page 1, CL1, Para 1, L2-5), the method further comprising, in a first

image of the sequence, identifying and analyzing a portion of the image corresponding to the fiducial markers to determining the 3-dimensional location and orientation of the surface in the image (Page 1, CL1, Para 1, L8-10; Page 1, CL2, Para 1, L2-6), and wherein the determining the 3-dimensional location and orientation of the surface in the first image of the sequence is used to identify the 2-dimensional positions at which the selected features occur in the first image of the sequence (Page 1, CL1, Para 1, L10-15 and Page 1, CL2, Para 1, L2-5).

Per claims 14 and 15, **Aman et al.** teaches that each fiducial marker comprises a unique distinguishing pattern (Fig. 3, Items 542, 544, 552 and 554; Page 1, Para 0019); and each fiducial marker is square-shaped (Page 1, Para 0019).

9.7 As per claim 16, **Aman et al., Rowe et al.** and **Kanbara et al.** teach the method of claim 1. **Aman et al.** and **Kanbara et al.** do not expressly teach that the 3-dimensional location and orientation of the surface in the current image of the sequence is determined without the use of explicit fiducial markers. **Rowe et al.** teaches that the 3-dimensional location and orientation of the surface in the current image of the sequence is determined without the use of explicit fiducial markers (CL2, L1-3; CL2, L13-16; CL2, L24-27).

9.8 As per claim 17, **Aman et al., Rowe et al.** and **Kanbara et al.** teach the method of claim 1. **Aman et al.** and **Rowe et al.** do not expressly teach capturing the sequence of images using the camera, and wherein the determination is made in real-time with respect to the capture.

Kanbara et al. teaches capturing the sequence of images using the camera, and wherein the determination is made in real-time with respect to the capture (Page 1, CL1, Para 1, L12-15).

9.9 As per claim 18, **Aman et al., Rowe et al.** and **Kanbara et al.** teach the method of claim 1. **Aman et al.** and **Rowe et al.** do not expressly teach that between two successive images of the sequence, the camera moves relative to the environment. **Kanbara et al.** teaches that between two successive images of the sequence, the camera moves relative to the environment (Page 1, CL1, Para 3, L7-8).

Per claim 19, **Aman et al.** teaches that between two successive images of the sequence, the surface moves relative to the environment (Page 1, Para 0002, L2-3).

9.10 As per Claim 20, it is a computer-readable medium claim having the same limitations as Claim 1, supra. Therefore, claim 20 is rejected based on the same reasoning as Claim 1, supra, as taught throughout by **Aman et al., Rowe et al.** and **Kanbara et al.**

9.11 As per claim 21, **Aman et al.** teaches a method in a computing system for tracking an object having an innate visual appearance (Page 1, Para 0001, Para 0012 and Para 0021; Page 4, Para 0071; Page 6, Para 0011, L1-4; Page 17, Para 0261; Page 21, Para 0297, L14-16; Page 21, Para 0306).

Aman et al. does not expressly teach a method in a computing system for tracking a 2-dimensional surface having an innate visual appearance; identifying visually significant aspects of the surface's innate visual appearance; and in a first of a series of perspective images of the surface, determining the 3-dimensional location and orientation of the surface in the first image. **Rowe et al.** teaches a method in a computing system for tracking a 2-dimensional surface having an innate visual appearance (CL2, L13-16; CL13, L20-21); identifying visually significant aspects of the surface's innate visual appearance (CL2, L13-16; CL13, L20-21); and in a first of a series of perspective images of the surface, determining the 3-dimensional location and orientation of the surface in the first image (CL2, L13-16; CL13, L20-21).

Aman et al. and **Rowe et al.** do not expressly teach innate visual appearance being marked with one or more explicit fiducial markers; performing recognition of the fiducial markers to determine the 3-dimensional location and orientation of the surface in the first image; and in successive perspective images of the surface, performing recognition of the identified aspects of the surface's innate visual appearance to determine the 3-dimensional location and orientation of the surface in the successive images. **Kanbara et al.** teaches innate visual appearance being marked with one or more explicit fiducial markers (Page 1, CL1, Para 1, L2-5); performing recognition of the fiducial markers to determine the 3-dimensional location and orientation of the surface in the first image (Page 1, CL1, Para 1, L8-10; Page 1, CL2, Para 1, L2-6); and in successive perspective images of the surface, performing recognition of the identified aspects of the surface's innate visual appearance to determine the 3-dimensional location and orientation of the surface in the successive images (Page 1, CL1, Para 1, L10-15 and Page 1, CL2, Para 1, L2-5; Page 1, CL2, Para 3, L1-8).

9.12 As per claim 22, **Aman et al., Rowe et al.** and **Kanbara et al.** teach the method of claim 21. **Aman et al.** and **Rowe et al.** do not expressly teach that the recognition of the identified aspects of the surface's innate visual appearance in each successive image is guided by the 3-dimensional location and orientation of the surface in the preceding image. **Kanbara et al.** teaches that the recognition of the identified aspects of the surface's innate visual appearance in each successive image is guided by the 3-dimensional location and orientation of the surface in the preceding image (Page 1, CL1. Para 1, L10-15 and Page 1, CL2, Para 1, L2-5).

Per claim 23, **Aman et al.** teaches that each fiducial marker is square-shaped (Page 1, Para 0019).

9.13 As per claim 24, **Aman et al., Rowe et al.** and **Kanbara et al.** teach the method of claim 21. **Aman et al.** and **Kanbara et al.** do not expressly teach the recognition of the identified aspects of the surface's innate visual appearance is predicated on an assumption that the selected features appear as coplanar in the successive perspective images. **Rowe et al.** teaches that the recognition of the identified aspects of the surface's innate visual appearance is predicated on an assumption that the selected features appear as coplanar in the successive perspective images (CL2, L13-16; CL13, L20-21).

9.14 As per Claim 25, it is a computer system claim having the same limitations as Claim 21, supra. Therefore, claim 25 is rejected based on the same reasoning as Claim 21, supra, as taught throughout by **Aman et al., Rowe et al.** and **Kanbara et al.**

9.15 As per claim 26, **Aman et al.** teaches based on the determined 2-dimensional locations, determining the 3-dimensional location of an object in a distinguished perspective image (Page 1, Para 0012 and Para 0014).

Aman et al. does not expressly teach based on the determined 2-dimensional locations, determining the 3-dimensional location and orientation of a subject surface in a distinguished perspective image. **Rowe et al.** teaches based on the determined 2-dimensional locations, determining the 3-dimensional location and orientation of a subject surface in a distinguished perspective image (CL2, L1-3; CL2, L13-16; CL2, L24-27).

Aman et al. and **Rowe et al.** do not expressly teach a method in a computing system for determining the 3-dimensional location and orientation of a subject surface in a distinguished perspective image of the subject surface, the subject surface having innate visual features, a subset of which are selected. **Kanbara et al.** teaches a method in a computing system for determining the 3-dimensional location and orientation of a subject surface in a distinguished perspective image of the subject surface, the subject surface having innate visual features, a subset of which are selected (Page 1, CL1, Para 1, L10-15 and Page 1, CL2, Para 1, L2-5; Page 1, CL2, Para 3, L1-8).

Aman et al. and **Rowe et al.** do not expressly teach using the location of the selected visual features in a perspective image of the subject surface that precedes the distinguished perspective image in time, identifying search zones in the distinguished perspective image; and searching the identified search zones for the selected visual features to determine the 2-dimensional locations at which the selected visual features occur. **Kanbara et al.** teaches using the location of

the selected visual features in a perspective image of the subject surface that precedes the distinguished perspective image in time, identifying search zones in the distinguished perspective image (Page 1, CL2, Para 2, L1-5; Page 1, CL2, Para 3, L1-3 and L5-7; Page 2, CL1, Para 1, L4-6; Page 2, CL1, Para 3, L7-10); and searching the identified search zones for the selected visual features to determine the 2-dimensional locations at which the selected visual features occur (Page 1, CL2, Para 3, L1-8).

9.15 As per claim 29, **Aman et al., Rowe et al.** and **Kanbara et al.** teach the method of claim 26. **Aman et al.** and **Rowe et al.** do not expressly teach the determination of the 2-dimensional locations at which the selected visual features occur. **Kanbara et al.** teaches determination of the 2-dimensional locations at which the selected visual features occur (Page 1, CL2, Para 2, L1-5).

Aman et al. and **Kanbara et al.** do not expressly teach that the determination of the 2-dimensional locations at which the selected visual features occur is predicated on an assumption that the selected visual features appear as coplanar in the image. **Rowe et al.** teaches that the determination of the 2-dimensional locations at which the selected visual features occur is predicated on an assumption that the selected visual features appear as coplanar in the image (CL2, L13-16; CL13, L20-21).

9.16 As per Claim 30, it is a computer-readable medium claim having the same limitations as Claim 26, supra. Therefore, claim 30 is rejected based on the same reasoning as Claim 26, supra, as taught throughout by **Aman et al., Rowe et al.** and **Kanbara et al.**

10. Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over **Aman et al.** (U.S. Patent Application 2003/0095186) in view of **Rowe et al.** (U.S. Patent 6,914,599), and further in view of **Kanbara et al.** ("A stereo vision-based mixed reality system with natural feature point tracking", March 2001, submitted by the applicants as part of IDS) and **Gibs et al.** (U.S. Patent Application 2002/0039111).

10.1 As per claim 10, **Aman et al., Rowe et al.** and **Kanbara et al.** teach the method of claim 1. **Aman et al., Rowe et al.** and **Kanbara et al.** do not expressly teach that the selection of identified features is performed based upon a comparison of the levels of accuracy with which they can be used to determine the position and orientation of the surface. **Gibs et al.** teaches that the selection of identified features is performed based upon a comparison of the levels of accuracy with which they can be used to determine the position and orientation of the surface (Page 2, Para 0017, L10-13 and L16-23; Page 2, Para 0024). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the method of **Aman et al., Rowe et al.** and **Kanbara et al.** with the method of **Gibs et al.** that included the selection of identified features being performed based upon a comparison of the levels of accuracy with which they could be used to determine the position and orientation of the surface, because that would allow determination of the location and movement of the features and output data signals by comparing the digitized images (Page 2, Para 0017, L10-13); and providing input to the computer program at a given time based on the location of the chosen portion in the video image from the camera at the given time (Page 2, Para 0016, L6-9).

11. Claim 27 is rejected under 35 U.S.C. 103(a) as being unpatentable over **Aman et al.** (U.S. Patent Application 2003/0095186) in view of **Rowe et al.** (U.S. Patent 6,914,599), and further in view of **Kanbara et al.** ("A stereo vision-based mixed reality system with natural feature point tracking", March 2001, submitted by the applicants as part of IDS) and **Sukthankar et al.** (U.S. Patent 6,618,076).

11.1 As per claim 27, **Aman et al., Rowe et al.** and **Kanbara et al.** teach the method of claim 26. **Aman et al., Rowe et al.** and **Kanbara et al.** do not expressly teach that the selected innate visual features of the subject surface number at least four. **Sukthankar et al.** teaches that the selected innate visual features of the subject surface number at least four (CL2, L1-3). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the method of **Aman et al., Rowe et al.** and **Kanbara et al.** with the method of **Sukthankar et al.** that included the selected innate visual features of the subject surface numbering at least four, because that would allow using the locations of a small set of features in both the source and camera frames and techniques of linear algebra to obtain parameters for mapping between the source and the camera frames (CL1, L64 to CL2, L1).

12. Claim 31 is rejected under 35 U.S.C. 103(a) as being unpatentable over **Aman et al.** (U.S. Patent Application 2003/0095186) in view of **Rowe et al.** (U.S. Patent 6,914,599), and further in view of **Gibs et al.** (U.S. Patent Application 2002/0039111).

12.1 As per claim 31, **Aman et al.** teaches one or more computing memories storing a visual tracking data structure for a surface having an appearance (Page 1, Para 0001, Para 0012 and Para 0021; Page 4, Para 0071; Page 6, Para 0011, L1-4; Page 17, Para 0261; Page 21, Para 0297, L14-16; Page 21, Para 0306).

Aman et al. does not expressly teach determining the distance and orientation of the surface with respect to the point in space from which the perspective image is captured. **Rowe et al.** teaches determining the distance and orientation of the surface with respect to the point in space from which the perspective image is captured (CL2, L1-3; CL2, L13-16; CL2, L24-27).

Aman et al. and **Rowe et al.** do not expressly teach the data structure comprising a plurality of natural feature templates, each natural feature template corresponding to a feature occurring in the appearance of the surface and containing adequate information to identify the feature in a perspective image of the surface, such that the contents of the data structure may be used to identify at least a subset of the features to which the natural feature templates correspond in a perspective image of the surface. **Gibs et al.** teaches the data structure comprising a plurality of natural feature templates, each natural feature template corresponding to a feature occurring in the appearance of the surface and containing adequate information to identify the feature in a perspective image of the surface (Fig. 2; Page 4, Para 0052), such that the contents of the data structure may be used to identify at least a subset of the features to which the natural feature templates correspond in a perspective image of the surface (Fig. 2; Page 4, Para 0052).

Allowable Subject Matter

13. Claims 8, 9, 11 and 28 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Conclusion

14. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Dr. Kandasamy Thangavelu whose telephone number is 571-272-3717. The examiner can normally be reached on Monday through Friday from 8:00 AM to 5:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Paul Rodriguez, can be reached on 571-272-3753. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to TC 2100 Group receptionist: 571-272-2100.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only.

For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

K. Thangavelu
Art Unit 2123
July 16, 2006